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Host plants of Lycaenidae on inflorescences in the central Brazilian cerrado

Neuza A. P. Silva[1], Marcelo Duarte[2], Ivone R. Diniz[3] and Helena C. Morais[4]*

[1]Programa de Pós Graduação em Ecologia, Instituto de Ciências Biológicas, Universidade de Brasília, 70910-900 Brasília, DF, Brazil.
[2]Museu de Zoologia, Universidade de São Paulo Avenida Nazaré 481, Ipiranga, 04263-000 São Paulo, SP, Brazil.
[3]Departamento de Zoologia, Instituto de Ciências Biológicas, Universidade de Brasília, 70910-900 Brasília, DF, Brazil.
[4]Departamento de Ecologia, Instituto de Ciências Biológicas, Universidade de Brasília, 70910-900 Brasília, DF, Brazil.
neuzaaps@gmail.com, mduartes@usp.br, irdiniz@unb.br, morais@unb.br

Abstract. A list of lycaenid butterflies reared on inflorescences is provided and discussed. Over 13,000 inflorescences from 35 plant families of the cerrado (a region with savanna-like vegetation) of Distrito Federal, Brazil, were examined. Larvae were reared in the laboratory and 321 adults from 38 lycaenid species were obtained from 55 plant species belonging to 24 families. A compilation of the host plant records is also presented based on data available in the literature. Our study points out that the sampling effort for obtaining immature stages of lycaenids in cerrado vegetation is crucial for a better understanding of the diversity and biology of these butterflies. Many species listed in this paper are widespread and tend to be locally polyphagous (using inflorescences of more than one plant family) or oligophagous (restricted to only one plant family). Some plant families, such as Proteaceae, Malpighiaceae, and Vochysiaceae, showed higher species richness and abundance of larvae than has been observed in Rubiaceae. Host plant records are provided for the first time for seven species of lycaenids.

Key words: *Cyanophrys*, Eumaeini, florivory, *Nicolaea*, oligophagy, *Paiwarria*, sampling effort, *Strymon*, Theclinae, Vochysiaceae.

Introduction

The feeding specificity of herbivorous insects is a central topic in the discussion of factors behind the mega-diversity of tropical insects (May, 1990; Odegaard *et al.*, 2000; Novotny *et al.*, 2006; Dyer *et al.*, 2007, Condon *et al.*, 2008; Lewinsohn & Roslin, 2008). Despite our increasing knowledge of phytophagous insects and their host plants, some recent catalogs (Pastrana, 2004; Santin, 2004; Beccaloni *et al.*, 2008) have shown that much work remains in the neotropics. For example, Beccaloni *et al.* (2008) estimate that there are records of host plants for only 26% of the approximately 8,000 species of neotropical butterflies. However, it is important to note that collecting information on the diet of herbivorous insects is a time-consuming activity that demands extensive field sampling, rearing immatures in the laboratory, depositing testimony material in collections, and precise species identification (Gaston, 1993; Godfray *et al.*, 1999).

Lycaenidae (Lepidoptera, Papilionoidea) are distributed worldwide and include at least 1,200 neotropical species in three subfamilies: Lycaeninae, Polyommatinae, and Theclinae (Lamas, 2004; Robbins, 2004a). Despite its high species richness, this family is comparatively less well known (Fiedler, 1995a; 2001; Pierce *et al.*, 2002; Robbins, 2004b) than other groups of butterflies (e.g., Pieridae, Papilionidae, and frugivorous nymphalids). However, the number of studies on the neotropical lycaenids is growing rapidly (e.g., Hall *et al.*, 2005; Nicolay & Robbins, 2005; Prieto & Dahners, 2006; Vila & Eastwood, 2006; Duarte & Robbins, 2010; Robbins *et al.*, 2010; Rodrigues *et al.*, 2010), but information on immature stages, host plants, and biology is still scarce (Duarte *et al.*, 2005; Duarte & Robbins, 2009; Kaminski *et al.*, 2010; Kaminski & Freitas, 2010).

Most phytophagous lycaenids are generalist feeders

*Corresponding author

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with a broad diet, especially in the tropics (Fiedler, 1995a). The tropical Theclinae may use ephemeral food resources, including expanding leaves, flower buds, and flowers (Robbins & Aiello, 1982; Chew & Robbins, 1984; Fiedler, 1995b; Feinstein *et al.*, 2007; Vargas & Parra, 2009), and in an ecosystem where the climate facilitates reproduction for several months a year, such predilections for nitrogen-rich plant parts may encourage polyphagy (Monteiro, 1991; Fiedler, 1995a).

The aim of this study was to sample larvae of Lycaenidae from inflorescences found in an area with savanna-like vegetation (cerrado) in central Brazil. Host plant records for 37 species of Theclinae and one species of Polyommatinae are presented, with a compilation of the host plant information available in the literature for these species. The huge sampling effort required to obtain lycaenid larvae in the cerrado vegetation and the polyphagy observed in the family are discussed.

Methods

Study area

The study was conducted in cerrado areas of the Fazenda Água Limpa (15°55'S-47°55'W), with sporadic surveys in three other nearby localities: Reserva Ecológica do IBGE (RECOR), Parque Nacional de Brasília and the campus of the Universidade de Brasília, Distrito Federal, Brazil. Fazenda Água Limpa (FAL) is an experimental and protected area with approximately 5,000 ha. It belongs to the Universidade de Brasília, and together with the Jardim Botânico de Brasília and the RECOR, it forms the core of the Environmental Protected Area known as "APA Gama e Cabeça de Veado" with approximately 20,000 ha.

The region is characterized by altitudes of around 1,050 m, an average annual temperature of 22ºC, an average annual rainfall of 1,416.8 mm (RECOR Meteorological Station), and a marked seasonality, with a lengthy dry season from May to September and a wet season from October to April. The vegetation includes many phytophysiognomies that range from grassland to gallery forest (for illustrations, see Goodland, 1971; Oliveira-Filho & Ratter, 2002), with predominance of cerrado *sensu stricto* (Ratter, 1980, Felfili & Silva Junior 1993).

Larval surveys

Larvae of Lycaenidae were sampled from inflorescences from the FAL area of the cerrado beginning in 1999 (Diniz & Morais, 2002, Morais *et al.*, 2009). Three data sets were analyzed in the present work: (a) quantitative samplings of inflorescences without visual inspection for larval presence (1999-2009), (b) quantitative samplings with visual inspection for larval presence (between March 2009 and March 2010, only those inflorescences with at least one larva were collected), and (c) inflorescence samplings conducted between April and December 2010. The first two data sets (the quantitative surveys) were considered to evaluate the field sampling effort of larvae, and the host plant records were compiled for each reared species. The cerrado vegetation is primarily characterized by shrubs and herbaceous plants, which allow direct examination of the inflorescences. Up to five inflorescences per plant were collected or examined in the field. From taller plants, the inflorescences were collected with the aid of a pruning hook. Plants with inflorescences were collected and examined with no prior selection of plant species.

All inflorescence samples were transferred to the laboratory and kept in individual plastic containers covered with thin fabric. Each inflorescence branch was inserted into a bottle containing water. The containers were checked and cleaned every two days, and any consumed inflorescences were regularly replaced by fresh ones. The plants were identified with the support of the Herbário da Universidade de Brasília (UB). The butterflies were deposited at the Museu de Zoologia da Universidade de São Paulo (MZUSP) and at the Coleção Entomológica do Departamento de Zoologia of the Universidade de Brasília.

Results

Sampling effort

In the quantitative samplings (data sets "a" and "b described in the Methods), 11,445 inflorescences belonging to 89 species and 31 families were analyzed. In the laboratory, 202 adults of Lycaenidae were obtained (Table 1). This sampling effort revealed an average of 1.8 adult lycaenids per 100 inflorescences. The inflorescences that were collected without prior visual inspection (n = 8,220) yielded 119 adult lycaenids, or 1.4 individuals per 100 inflorescences, and the active search for larvae (n = 3,225 examined inflorescences) revealed 83 adult lycaenids or 2.6 individuals per 100 inflorescences.

In total (data sets "a", "b", and "c" described in the Methods), over 13,000 flowers belonging to 95 species and 35 plant families were examined. The 321 adult lycaenids obtained under laboratory conditions emerged from 55 species on 24 plant families (Table 2). A compilation of published records of larval host

Table 1. Sampling effort for Lycaenidae larvae in inflorescences in the cerrado of the Distrito Federal, Brazil, number of adults reared in laboratory. The nomenclature and authorship of the species are as given by Cavalcanti & Ramos (2001). The arrangement of the families follows the Angiosperm Phylogeny Website (http://www.mobot.org/MOBOT/research/APweb/).

Examined Plants		Examined or collected inflorescences	Number of Lycaenidae (adults)
Family	Species		
Annonaceae	*Annona coriaceae* Mart.	1	0
Velloziaceae	*Vellozia squamata* Pohl	15	0
Arecaceae	*Syagrus flexuosa* (Mart.) Becc.	5	0
Proteaceae	*Roupala montana* Aubl.	595	16
Celastraceae	*Plenkia polpunea* Reissek	2	0
Connaraceae	*Rourea induta* Planch.	447	7
Calophyllaceae	*Kielmeyera* spp. (2 species)	214	2
Caryocaraceae	*Caryocar brasiliense* Camb.	653	8
Euphorbiaceae	*Delachampia caperonioides* Baill.	50	0
Euphorbiaceae	*Maprounea guianensis* (Aubl.) Müll. Arg.	4	0
Salicaceae	*Casearia sylvestris* Sw.	148	4
Malpighiaceae	*Banisteriopsis* spp. (2 species)	105	0
Malpighiaceae	*Byrsonima* spp. (6 species)	471	20
Malpighiaceae	*Heteropterys* spp. (3 species)	67	4
Malpighiaceae	*Peixotoa* spp. (2 species)	153	4
Malpighiaceae	*Pterandra pyroidea* A. Juss.	30	2
Ochnaceae	*Ouratea hexasperma* (St.Hil) Baill.	279	3
Fabaceae	*Calliandra dysantha* Benth.	19	4
Fabaceae	*Chamaecrista* spp. (3 species)	277	0
Fabaceae	*Dalbergia miscolobium* Benth.	55	0
Fabaceae	*Dimorphandra mollis* Benth.	100	0
Fabaceae	*Galactia* sp.	2	0
Fabaceae	Fabaceae spp. (2 species)	37	2
Fabaceae	*Mimosa* spp. (4 species)	527	22
Fabaceae	*Periandra* sp.	265	3
Fabaceae	*Pterodon pubescens* (Benth.) Benth.	123	1
Fabaceae	*Stryphnodendron adstringens* (Mart.) Cov.	33	0
Lythraceae	*Diplusodon* sp.	60	4
Melastomataceae	*Leandra aurea* (Cham.) Cogn.	35	0
Melastomataceae	*Miconia* spp. (5 species)	1378	26
Myrtaceae	*Blepharocalyx salicifolius* (H., B. & K.)	100	0
Myrtaceae	*Myrcia* spp. (3 species)	23	0
Vochysiaceae	*Qualea grandiflora* Mart.	851	24
Vochysiaceae	*Vochysia elliptica* Mart.	553	11
Anacardiaceae	*Anacardium humile* St.Hil.	36	0
Burseraceae	*Protium ovatum* Engl.	100	0
Rutaceae	*Spiranthera odoratissima* St. Hil.	16	0

Table 1. Cont.

Malvaceae	*Eriotheca pubescens* (Mart.&Zucc.) S. & E.	100	0
Malvaceae	*Pavonia rosa-campestris* St. Hil.	10	0
Loranthaceae	*Phthirusa ovata* (DC.) Eichler	191	0
Primulaceae	*Cybianthus detergens* Mart.	196	0
Primulaceae	*Rapanea guianensis* Aubl.	162	0
Styracaceae	*Styrax ferrugineus* Ness & Mart.	100	1
Rubiaceae	*Chomelia ribesioides* Benth.	203	2
Rubiaceae	*Ferdinandusa elliptica* Pohl	4	0
Rubiaceae	*Palicourea coriacea* (Cham.) K. Schum.	798	0
Rubiaceae	*Tocoyena formosa* (C. & S.) K. Schum.	3	0
Bignoniaceae	*Arrabidae brachypoda* (DC.)	5	1
Bignoniaceae	*Jacaranda ulei* Bureau & K. Schum.	52	0
Bignoniaceae	*Zeyhera montana* Mart.	8	0
Lamiaceae	*Hyptis* sp.	100	0
Lamiaceae	*Aegiphila lhotzkiana* L.	3	0
Verbenaceae	*Lippia rotundifolia* Cham.	34	0
Solanaceae	*Solanum lycocarpum* St. Hil.	287	4
Asteraceae	*Aspilia foliacea* (Spreng.)	65	1
Asteraceae	Asteraceae spp. (2 species)	5	0
Asteraceae	*Eremanthus* spp. (2 species)	118	0
Asteraceae	*Gochnatia* sp.	2	0
Araliaceae	*Schefflera macrocapa* (Cham. & Schltdl.)	1170	26
	TOTAL	11445	202

plants for these butterflies is also given in Table 2.

Lycaenidae and their larval host plants

In this study, 37 species of Theclinae (Eumaeini) and one species of Polyommatinae were reared from 55 plant species (Table 2). *Calycopis mimas* (Godman & Salvin, 1887), *Chalybs hassan* (Stoll, 1790), *Cyanophrys acaste* (Prittwitz, 1865), *Ostrinotes empusa* (Hewitson, 1867), *Strymon cyanofusca* K. Johnson, Eisele & MacPherson, 1990, and *Rekoa stagira* (Hewitson, 1867) are the first records for the Distrito Federal, central Brazil (see also Emery *et al.*, 2006; Pinheiro & Emery, 2006; Pinheiro *et al.*, 2008). *Qualea grandiflora* Mart. (Vochysiaceae) is recorded for the first time as a larval host plant of *Thepytus thyrea* (Hewitson, 1867) (see Robbins *et al.*, 2010); for six other eumaeines, *Ignata norax* (Godman & Salvin, 1887), *Nicolaea socia* (Hewitson, 1868), *Paiwarria aphaca* (Hewitson, 1867), *Strymon crambusa* (Hewitson, 1874), *Strymon cyanofusca*, K. Johnson, Eisele & MacPherson, 1990, and *Tmolus cydrara* (Hewitson, 1868), host plant records were not found in the literature (Table 2). Illustrations of larvae and adults with biological notes (e.g., myrmecophily and parasitism) will be presented elsewhere.

Discussion

Sampling effort

Our larval surveys of the central cerrado show that the frequency of immature stages of Lycaenidae is relatively low when compared to two other South American habitats. Vargas and Parra (2009) obtained an average of 2.4 larvae of three lycaenid species in 50 inflorescences of *Acacia macracantha* Willd. (Fabaceae) in northern Chile. In a two-year study of the restinga vegetation of Rio de Janeiro (Brazil), Monteiro (1990) obtained 500 eggs and larvae of *Rekoa marius* (Lucas, 1857) and 150 eggs and larvae of *Rekoa palegon* (Cramer, 1780).

The number of adults obtained in laboratory depends on the frequency of larvae observed in the field and on the rearing success. Even if we consider a high mortality rate of 50%, the frequency of lycaenid larvae found by our quantitative samplings remained low.

Visual inspections of the inflorescences contributed to the successful capture of larvae and the ability to observe their interactions with ants. The collection and maintenance of the flowers in the laboratory allowed us to observe larvae with internal development in reproductive plant tissues, a possible generalized behavior for juvenile larvae of Eumaeini (e.g., Pierce & Easteal, 1986; Kaminski *et al.*, 2010). The larvae of several species of lycaenids are cryptic, as their colors are similar to the consumed inflorescence (Monteiro, 1991; Grimble & Beckwith, 1993; Kaminski & Freitas, 2010). Thus, the methods used in this study complement the field collection of immature stages of these butterflies.

Use of cerrado plants by Lycaenidae

Our experience collecting larvae on leaves and flowers in cerrado, which has stretched over a decade, corroborates evidence from Chew and Robbins (1984) that indicates a predilection of the Eumaeini larvae to feed on flowers, fruits and, more rarely, on leaves (Morais *et al.*, 2009).

The occurrence of *Rekoa palegon* on inflorescences of several species of Asteraceae confirms the observations of Robbins (1991a) and Monteiro (1991) relating to this plant family. Monteiro (1990) noted that the reproduction of *R. palegon* was concentrated in April and June, which coincides with the flowering of their major host plants in the resting area of Rio de Janeiro: *Mikania hoehnei* B. L. Rob., *M. stipulacea* Willd., *Eupatorium laxum* Gardner and *Vernonia scorpioides* (Lam.) Pers. *Rekoa marius* were highly polyphagous as observed by Monteiro (1991) and Robbins (1991a). Monteiro (1990) noted the frequent use of one species of Bignoniaceae and one species of Fabaceae. Despite the high polyphagy of this butterfly, Monteiro (1990) did not succeed in rearing larvae in Asteraceae species. *Rekoa stagira* appears as the first record for the Distrito Federal, Brazil, and this supports the observations of Robbins (1991a) regarding the rarity of this species when compared to its closest relatives.

Electrostrymon endymion (Fabricius, 1775) and *Kisutam syllis* (Godman & Salvin, 1887) may be facultative detritivores like other species in the subtribe Calycopidina (see Duarte & Robbins, 2010). *Kisutam syllis* is one of the most common eumaeine species and is especially abundant around decaying fruit on the wet forest floor (Duarte & Robbins, 2010). The present study observed that both species use flowers lying on the ground (the feeding habit is known as saproflorivory *sensu* Feinstein *et al.* 2007). However, two other Calycopidina species, *Calycopis mimas* and *C. calor* (H. H. Druce, 1907), were found on inflorescences, and Duarte and Robbins have additional unpublished data suggesting that the lineage to which these two species belong is not detritivorous.

There are many taxa of tropical lycaenids that tend to be polyphagous, especially on groups with obligate ant association and the flower- and fruit-feeders (e.g., Fiedler, 1994; Pierce *et al.*, 2002). For the neotropical Eumaeini, however, this perspective seems to be influenced by the occurrence of common species with wide geographical distributions and information on host plants collected in various regions.

Information scattered in the literature on a number of neotropical Eumaeini suggests a higher occurrence of oligophagy than has been previously reported. This is exemplified by the association of *Ministrymon azia* (Hewitson, 1873) with Fabaceae, *Michaelus thordesa* (Hewitson, 1867) with Bignoniaceae (Table 2), *Allosmaitia strophius* (Godart, [1824]) with Malpighiaceae (Kaminski & Freitas, 2010) and the genus *Arawacus* Kaye with Solanaceae (Robbins & Aiello, 1982; Robbins, 1991b; 2000; Gentry, 2003; Beccaloni *et al.*, 2008; Janzen & Hallwachs, 2010). However, Asteraceae is cited as a host plant for two species of *Arawacus*, *A. ellida* (Hewitson, 1867) and *A. binangula* (Schaus, 1902) (Robbins, 2000). In addition, Fabaceae is referred to *A. tarania* (Hewitson, 1868) (Robbins, 2000; Beccaloni *et al.*, 2008). All of these species have a wide geographical distribution: *M. azia* is found from the USA to Argentina, *Allosmaitia strophius* is found from south Texas to southern Brazil, and *Arawacus ellida* is found throughout South America.

Some species are locally highly polyphagous, occurring on at least five plant families at one cerrado site: *Kolana ergina* (Hewitson, 1867), *Nicolaea socia*, *Parrhasius polibetes* (Stoll, 1781), *Strymon mulucha* (Hewitson, 1867), and *Tmolus echion* (Linnaeus, 1767). Some species have a wide geographical distribution, including *K. ergina* (South America), *P. polibetes* (Mexico to Uruguay), *S. mulucha* (Mexico to Argentina), and *T. echion* (South Texas to Argentina).

Table 2. Lycaenidae species whose caterpillars were found and reared on host plants in cerrado of the Distrito Federal, Brazil. Information on host plants families from others areas was compiled from other sources.

Lycaenidae Species	Adults in lab.	Food resource	Families and species of hostplants in cerrado	Families of hostplants in other areas	References
Theclinae - Eumaeini					
Allosmaitia strophius (Godart, [1824])	51	Inflorescence and young fruits	**Malpighiaceae** (*Byrsonima pachyphylla, B. subterranea, B. verbascifolia, B. viminifolia, Heteropterys procoriacea, Heteropterys* sp., *Peixotoa goiana, Pterandra pyroidea*, species not identified)	Malpighiaceae	Kaminski & Freitas 2010
Arawacus ellida (Hewitson, 1867)	1	Inflorescence	**Solanaceae** (*Solanum lycocarpum*)	Asteraceae	Robbins 2000
Calycopis calor (H. H. Druce, 1907)	19	Inflorescence	**Calophyllaceae** (*Kielmeyera coriacea, Kielmeyera* sp.), **Caryocaraceae** (*Caryocar brasiliense*), **Vochysiaceae** (*Qualea grandiflora*)	Malpighiaceae; genus with some facultative detritivores species	Duarte *et al.* 2005, Duarte & Robbins 2009, Torezan Silingardi 2007
Calycopis mimas (Godman & Salvin, 1887)	1	Inflorescence	**Lythraceae** (*Diplusodon* sp.)	Melastomataceae, genus with some facultative detritivores species	Beccaloni *et al.* 2008, Duarte *et al.* 2005, Duarte & Robbins 2009
Chalybs hassan (Stoll, 1790)	2	Inflorescence	**Araliaceae** (*Schefflera macrocarpa*), **Malpighiaceae** (*Peixotoa goiana*)	Fabaceae	Beccaloni *et al.* 2008
Chlorostrymon telea (Hewitson, 1868)	4	Inflorescence	**Fabaceae** (*Pterodon pubescens*), **Proteaceae** (*Roupala montana*)	Sapindaceae, Sterculiaceae	Beccaloni *et al.* 2008, Janzen & Hallwachs 2010
Cyanophrys herodotus (Fabricius, 1793)	14	New leaves and inflorescence	**Araliaceae** (*Schefflera macrocarpa*), **Proteaceae** (*Roupala montana*), **Rubiaceae** (*Chomelia ribesioides*)	Adoxaceae (= Dipsacaceae), Anacardiaceae, Asteraceae, Boraginaceae, Malvaceae, Sambucaceae, Verbenaceae	Robbins & Duarte 2005
Cyanophrys acaste (Prittwitz, 1865)	1	Inflorescence	**Fabaceae** (*Dalbergia miscolobium*)	Asteraceae, Ulmaceae	Robbins & Duarte 2005, Beccaloni *et al.* 2008
Electrostrymon endymion (Fabricius, 1775)	1	Fallen flowers	**Vochysiaceae** (*Qualea grandiflora*)	Detritivores	Duarte & Robbins 2010
Erora aff. *biblia* (Hewitson, 1868)	1	Inflorescence	**Melastomataceae** (*Miconia fallax*)	--	
Erora aff. *gabina* (Godman & Salvin 1887)	4	Inflorescence	**Melastomataceae** (*Miconia albicans, M. pohliana*), **Vochysiaceae** (*Qualea grandiflora*)	--	
Gargina aff. *thyesta* (Hewitson, 1869)	1	Inflorescence	**Proteaceae** (*Roupala montana*)	--	
Ignata norax (Godman & Salvin, 1887)	1	Inflorescence	**Caryocaraceae** (*Caryocar brasiliense*)	Not found in the literature	
Kisutam syllis (Godman & Salvin, 1887)	6	Fallen flowers	**Vochysiaceae** (*Qualea grandiflora*)	Anacardiaceae, Combretaceae; facultative detritivores species	Beccaloni et al. 2008, Duarte & Robbins 2010
Kolana ergina (Hewitson, 1867)	7	New leaves and inflorescence	**Araliaceae** (*Schefflera macrocapa*), **Connaraceae** (*Rourea induta*), **Malpighiaceae** (*Byrsonima pachyphylla*), **Melastomataceae** (*Miconia albicans*), **Ochnaceae** (*Ouratea hexasperma*), **Vochysiaceae** (*Vochysia elliptica*)	Araliaceae, Malpighiaceae (leaves of *Byrsonima sericea*)	Flinte *et al.* 2006, Kaminski 2010

Table 2. Cont.

Michaelus thordesa (Hewitson, 1867)	3	Inflorescence	**Bignoniaceae** (*Jacaranda ulei*), **Fabaceae** (*Bauhinia* sp.)	Bignoniaceae	Kaminski *et al.* 2010, Monteiro 1990, Zikán & Zikán 1968
Ministrymon azia (Hewitson, 1873)	22	Inflorescence	**Fabaceae** (*Mimosa foliosa, M. lanuginosa, M. radula*)	Anacardiaceae, Fabaceae	Miller & Miller 1997, Vargas & Parra 2009
Nicolaea cauter (H. H. Druce, 1907)	3	Inflorescence	**Proteaceae** (*Roupala montana*), **Vochysiaceae** (*Vochysia elliptica*)	Ochnaceae	Beccaloni *et al.* 2008
Nicolaea socia (Hewitson, 1868)	18	Inflorescence	**Araliaceae** (*Schefflera macrocarpa*), **Caryocaraceae** (*Caryocar brasiliense*), **Connaraceae** (*Rourea induta*), **Malpighiaceae** (*Byrsonima verbascifolia*), **Melastomataceae** (*Miconia ferruginata*), **Proteaceae** (*Roupala montana*) **Vochysiaceae** (*Qualea parviflora, Vochysia elliptica*)	Not found in the literature	
Ocaria ocrisia (Hewitson, 1868)	3	Inflorescence	**Proteaceae** (*Roupala montana*)	Fagaceae, Ochnaceae, Polygonaceae, Sapindaceae	Beccaloni *et al.* 2008, Canals 2003, Monteiro 1990
Olynthus aff. *punctum* (Herrich-Schäffer, [1853])	3	Inflorescence	**Caryocaraceae** (*Caryocar brasiliense*)	--	
Ostrinotes empusa (Hewitson, 1867)	5	Inflorescence	**Malpighiaceae** (*Byrsonima coccolobifolia, Peixotoa goiana*), **Proteaceae** (*Roupala montana*)	Sterculiaceae	Beccaloni *et al.* 2008
Paiwarria aphaca (Hewitson, 1867)	6	New leaves and inflorescence	**Celastraceae** (*Salacia crassifolia, Salacia* sp. ?)	Not found in the literature	
Parrhasius polibetes (Stoll, 1781)	45	New leaves and inflorescence	**Araliaceae** (*Schefflera macrocarpa*), **Bignoniaceae** (*Arrabidea brachypoda*), **Lythraceae** (*Diplusodon* sp.), **Malpighiaceae** (*Byrsonima coccolobifolia, B. verbascifolia,* species not identified), **Melastomataceae** (*Miconia albicans, M. fallax, M. ferruginata*), **Ochnaceae** (*Ouratea hexasperma*), **Proteaceae** (*Roupala montana*), **Styracaceae** (*Styrax ferrugineus*), **Vochysiaceae** (*Qualea grandiflora, Q. parviflora*)	Araliaceae, Bignoniaceae, Chrysobalanaceae, Combretaceae, Euphorbiaceae, Fabaceae, Malpighiaceae, Malvaceae, Melastomataceae, Myrtaceae, Sapotaceae, Sapindaceae, Styracaceae	Beccaloni *et al.* 2008, Kaminski *et al.* 2010, Rodrigues *et al.* 2010, Torezan Silingardi 2007
Pseudolycaena marsyas (Linnaeus, 1758)	2	Inflorescence	**Ochnaceae** (*Ouratea hexasperma*)	Anacardiaceae, Combretaceae, Fabaceae (Papilionoideae), Meliaceae, Myrtaceae, Polygonaceae, Resedaceae, Rosaceae, Sapotaceae, Sterculiaceae, Ulmaceae	Beccaloni *et al.* 2008
Rekoa marius (Lucas, 1857)	7	Inflorescence	**Fabaceae** (species not identified), **Malpighiaceae** (species not identified), **Melastomataceae** (*Miconia fallax*), **Ochnaceae** (*Ouratea hexasperma*), **Proteaceae** (*Roupala montana*), **Vochysiaceae** (*Qualea grandiflora*)	Apocynaceae, Araliaceae, Bignoniaceae, Boraginaceae, Combretaceae, Fabaceae, Malpighiaceae, Melastomataceae, Myrtaceae, Ochnaceae, Polygonaceae, Sapindaceae, Verbenaceae	Kaminski 2010, Monteiro 1991, Robbins 1991a, Torezan Silingardi 2007

Table 2. Cont.

Rekoa palegon (Cramer, 1780)	4	Inflorescence	**Asteraceae** (*Aspilia foliacea, Baccharis dracunculifolia, Chromolaena pedunculosa, Lepdaploa* sp., species of Eupatorie not identified)	Araliaceae, Boraginaceae, Euphorbiaceae, Fabaceae, Melastomataceae, Ochnaceae, Polygonaceae, Solanaceae, Verbenaceae, Ulmaceae	Beccaloni *et al.* 2008, Kaminski 2010, Monteiro 1990, Robbins 1991a
Rekoa stagira (Hewitson, 1867)	1	Inflorescence	**Proteaceae** (*Roupala montana*)	Araliaceae, Malpighiaceae, Fabaceae	Kaminski 2010, Robbins 1991a
Strymon bazochii (Godart, [1824])	8	Inflorescence	**Verbenaceae** (species not identified)	Lamiaceae, Verbenaceae	Beccaloni *et al.* 2008, Janzen & Hallwachs 2010
Strymon bubastus (Stoll, 1780)	1	Inflorescence	**Fabaceae** (*Galactia* sp.)	Boraginaceae, Convolvulaceae, Fabaceae, Malvaceae, Portulacaceae	Beccaloni *et al.* 2008
Strymon crambusa (Hewitson, 1874)	1	Inflorescence	**Oxalidaceae** (*Oxalis* sp.)	Not found in the literature	
Strymon cyanofusca K. Johnson, Eisele & MacPherson, 1990	5	Inflorescence	**Gentianaceae** (*Calolisianthus speciosus*)	Not found in the literature	
Strymon mulucha (Hewitson, 1867)	43	Inflorescence	**Connaraceae** (*Rourea induta*), **Fabaceae** (*Bauhinia* sp., *Calliandra dysantha, Galactia* sp., *Periandra* sp.), **Malpighiaceae** (*Heteropterys procoriacea, Peixotoa goiana,* species not identified), **Malvaceae** (*Pavonia rosa-campestris*), **Ochnaceae** (*Ouratea hexasperma*), **Salicaceae** (*Casearia sylvestris*), **Sapindaceae** (*Serjania* sp.)	Alstroemeriaceae, Bignoniaceae, Malvaceae, Melastomataceae, Orchidaceae	Beccaloni *et al.* 2008, Canals 2003, Monteiro 1990
Thepytus thyrea (Hewitson, 1867)	1	Inflorescence	**Vochysiaceae** (*Qualea grandiflora*)	No previus record of hostplant	Robbins *et al.* 2010
Tmolus cydrara (Hewitson, 1868)	1	Inflorescence	**Vochysiaceae** (*Qualea grandiflora*)	Not found in the literature	
Tmolus echion (Linnaeus, 1767)	11	Inflorescence	**Campanulaceae** (*Amazonia hirta*), **Connaraceae** (*Rourea induta*), **Ochnaceae** (*Ouratea hexasperma*), **Solanaceae** (*Solanum lycocarpum*), **Vochysiaceae** (*Qualea grandiflora, Q. multiflora*)	Acanthaceae, Anacardiaceae, Boraginaceae, Fabaceae, Gesneriaceae, Lamiaceae, Malpighiaceae, Malvaceae, Ochnaceae, Sapindaceae, Solanaceae, Verbenaceae	Beccaloni *et al.* 2008, Canals 2003, Monteiro 1990, Robbins & Aiello 1982
Tmolus venustus (H. H. Druce, 1907)	11	Inflorescence	**Fabaceae** (*Galactia* sp.), **Malpighiaceae** (*Peixotoa goiana, Pterandra pyroidea,* species not identified), **Melastomataceae** (*Miconia ferruginata, M. pohliana*), **Ochnaceae** (*Ouratea hexasperma*)	Malpighiaceae	Torezan Silingardi 2007
Polyommatinae					
Hemiargus hanno (Stoll, 1790)	3	Inflorescence	**Fabaceae** (*Galactia* sp.), **Malpighiaceae** (species not identified)	Fabaceae, Oxalidaceae	Beccaloni et al. 2008, Duarte *et al.* 2001

In contrast, *N. socia* is currently restricted to the cerrado vegetation (see also Brown, 1993, where the species is cited as *Thecla socia*).

Some cerrado plant species support a high species richness of lycaenids (Table 2): *Roupala montana* Aubl. (Proteaceae) supports 10 species, *Qualea grandiflora* supports nine species, *Ouratea hexasperma* (St. Hil) Baill. (Ochnaceae) supports seven species, *Peixotoa goiana* C.E. Anderson (Malpighiaceae) supports five species, and *Caryocar brasiliense* Camb. (Caryocaraceae), *Rourea induta* Planch. (Connaraceae) and *Schefflera macrocarpa* (Seem) D. C. Frodin (Araliaceae) each support larvae of four different species. Except for *Q. grandiflora*, all of these plants show some taxonomic isolation, as each family is represented by up to four species in the cerrado of the Distrito Federal (Cavalcanti & Ramos, 2001). Large families of flowering plants, such as Fabaceae, Myrtaceae, and especially Asteraceae, were proportionately less sampled. Genera of large families that were conspicuous in the study area, such as *Byrsonima* Rich. (Malpighiaceae), *Miconia* Ruiz & Pav. (Melastomataceae), *Palicourea* Aubl. (Rubiaceae) and *Qualea* Aubl. (Vochysiaceae), were relatively well sampled (Table 1). Interestingly, the nearly complete absence of larvae feeding on Rubiaceae contrasts with the high number of lycaenid species on Vochysiaceae. The low number of lycaenids associated with Rubiaceae is in accordance with the information presented by Fiedler (1995b); in contrast, our results with Vochysiaceae may be the first in the literature.

Roupala montana, *S. macrocarpa* and *R. induta* do not have extra floral nectaries, but the two first species, as well as *Byrsonima* (revised by Kaminski & Freitas, 2010), often present hemipterans attended by ants on their inflorescences. Other genera, such as *Banisteriopsis* C.B. Rob., Peixotoa A. Juss. (Malpighiaceae), and *Qualea* present foliar extrafloral nectaries (Oliveira & Leitão-Filho, 1987). *Caryocar brasiliense* was the only species with considerable Lycaenidae species richness in our study, bearing extrafloral nectaries on their inflorescences (Oliveira, 1997). The cerrado vegetation is composed of a high proportion of species and individuals with extrafloral nectaries (Oliveira & Leitão-Filho, 1987), but the vast majority of plants have nectaries on their leaves. Thus, the influence of the extrafloral nectaries on plant consumption by florivorous lycaenids must be small. However, characteristics of the inflorescences, such as size and structure, and the presence of ants associated with hemipterans may be important factors for the choice of host plants (Monteiro, 1990; Oliveira & DelClaro, 2005; Rodrigues *et al.*, 2010).

An understanding of the immature stages of Lepidoptera is of major importance to studies of phylogeny and taxonomy (e.g., Lafontaine *et al.*, 1982; Aiello, 1984; Epstein, 1996; DeVries *et al.*, 2004; Hebert *et al.*, 2004; Warren *et al.*, 2009), particularly in taxonomically complex groups such as the tribe Eumaeini (Lycaenidae, Theclinae). As noted by Duarte *et al.* (2005) and in the present study, the immature stages of the eumeines are not readily found in the field. One interesting alternative for the study of all immature stages of some species, especially those that feed on artificial diet as larvae (Duarte *et al.*, 2005; Duarte & Robbins, 2009), is to obtain the eggs and rear them in laboratory. However, this methodology does not allow describing patterns of host plant use by larvae. Therefore, more fieldwork and laboratory rearing are necessary to understand the biology and habitat restrictions of these butterflies and for their conservation in critically threatened biomes such as the Brazilian cerrado. Information gathered from this type of work may contribute to the development of further biological and morphological studies of the immature stages of Lycaenidae and, in some cases, help to resolve a number of taxonomic uncertainties largely relating to incorrect associations between males and females of dimorphic (or polymorphic) species (Robbins *et al.*, 2010).

This work reports 113 records of host plants for 38 species of lycaenids, with host plant records mentioned for the first time for seven of these species. Also, it adds six species of Lycaenidae to the lists of butterflies from Distrito Federal. Although, butterflies are considered a well-known group of insects, it is surprising how little is still known about their host plants (Beccaloni *et al.*, 2008). Thus, collecting juveniles on inflorescences can supplement adult collection for documenting the fauna of a region. Despite the restricted study area, there is much work to be done in view of the high species richness of Lycaenidae and plants.

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